CITY OF GLENDALE, CALIFORNIA
Community Development Department
BUILDING & SAFETY DIVISION

633 East Broadway
Glendale, California 91206-4390
Inspections (818) 548-4836
Plan Check & Permits (818) 548-3200
www.ci.glendale.ca.us

August 23, 2012

Mr. Joe Loyer
California Energy Commission
1516 Ninth Street MS37
Sacramento, Ca 95814-5514

Re: Green Building Ordinance and the Building Energy Efficiency Standards

Dear Joe,

As I previously discussed with you, I have assembled a full package of materials to make the City of Glendale's filing simple for you. Enclosed herewith are the following materials, in this order:

1) Application cover letter to Mr. Robert Oglesby, Executive Director, dated August 23, 2012.
2) Agenda from the August 15, 2012 City of Glendale, Building and Fire Board of Appeals public meeting. This meeting was a regularly scheduled, publicly noticed meeting in accordance with the Ralph M. Brown Act.
3) Staff Report for Agenda Item VI-A (Public Hearing – Energy cost effectiveness study related to local amendments to the 2010 California Green Building Code standards.)
4) Final Action Letter, dated August 21, 2012, summarizing results of the public hearing. Letter signed by Mr. Keshisiah, Chairman of the City of Glendale, Building & Fire Board of Appeals.
5) Copy of Ordinance No. 5736, approved by the Glendale City Council on June 7, 2011.
6) Energy Cost Effectiveness study, dated May 18, 2012 by Michael Gabel, Gabel Associates, LLC.

I believe this is everything that you should require. If additional information is desired, please feel free to contact me at (818) 548-3200.

Respectfully,

Stuart Tom, P.E., CBO
Building Official

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August 23, 2012

Mr. Robert Oglesby
Executive Director
California Energy Commission
1516 Ninth Street
Sacramento, Ca 95814-5514

Re: Green Building Ordinance and the Building Energy Efficiency Standards

Dear Mr. Oglesby,

Per the request of Commission Staff, we would like to express to you our firm commitment to have the City of Glendale, California enforce the current Title 24 Building Energy Efficiency Standards as part of the implementation of our local energy ordinance. As the Chief Building Official, I will work with my staff involved in energy plan review and field inspection to improve their working knowledge of the energy standards. This includes special training as needed which focuses on enforcement of the energy standards and the special requirements of the Ordinance.

On June 7, 2011, I presented to the *Glendale City Council*, the Green Building Ordinance which was approved as Ordinance No. 5736. At a separate meeting I presented the Energy Cost Effective Study to the *City of Glendale Building and Fire Board of Appeals*. The Board recognized the study analysis showing energy saving and cost effectiveness during an open public hearing at their August 15, 2012 regularly calendared business meeting. The Board approved the Ordinance and Energy Cost Effectiveness Study. Both the June 7, 2011 Glendale City Council Session and the August 15, 2012 City of Glendale Building and Fire Board of Appeals Session were regularly scheduled, open public meetings that were noticed and agendized in accordance with the "Open Meetings for Legislative Bodies" standards of the California Brown Act.

The Green Building Regulations will ensure that residential and non-residential buildings in the City of Glendale will consume no more energy than permitted by Title 24, Part 6. A copy of Ordinance No. 5736 is available for public review in the Office of the Glendale City Clerk. A copy of said ordinance and a copy of the Energy Cost Effectiveness Study has been submitted to the Energy Commission staff. If additional information is desired, please feel free to contact me at (818) 548-3200.

Respectfully,

Stuart Tom, P.E., CBO
Building Official

– A G E N D A –
BUILDING AND FIRE BOARD OF APPEALS
633 E. Broadway, Room # 106
Glendale, CA 91206

Welcome to the meeting of the Building and Fire Board of Appeals. Meetings are broadcast live on cable channel 6 (GTV6) and rebroadcast throughout the week. Call (818) 548-4013 for program schedules. DVDs of the proceedings are available for purchase in the City Clerk's Office. Meetings are also archived on the City Website for viewing anytime at www.ci.glendale.ca.us/video_archives.asp.

PLEASE TURN OFF CELLULAR PHONES AND PAGERS WHILE INSIDE THE HEARING ROOM.

In compliance with the Americans with Disabilities Act (ADA) of 1990, auxiliary hearing aids, sign language translation, and Braille transcripts are available upon request. Assisted listening devices are available same-day upon request. At least 48 hours (or two business days) notice is required for requests regarding sign language translation and Braille transcription services.

All documents related to open session items on this agenda that are received less than 72 hours prior to this meeting, and are public records, will be available for review in the Permit Services Office, 633 E. Broadway, RM 101, Glendale, CA 91206.

If you have any question about matters on the agenda, or requests for assistance, please contact the Building Official at (818) 548-3214 during regular business hours.

August 15, 2012
2:00 p.m.

I. ROLL CALL

II. PRESENTATIONS & COMMENDATIONS
(NONE)

III. ORAL COMMUNICATIONS
Discussion is limited to items not a part of this Agenda. Each speaker is allowed 5 minutes. The Board may question the speaker but there will be no debate or decision. The Board may refer the matter to Building & Safety staff for investigation and report.

IV. APPROVAL OF MINUTES OF PREVIOUS MEETING
A) December 15, 2010.

V. OLD BUSINESS
(NONE)

VI. NEW BUSINESS
A) Public Hearing- Energy cost effectiveness study related to local amendments to the 2010 California Green Building Code standards.

Description: Public review of said energy cost effectiveness study by the Building and Fire Board of Appeals, precedent to filing of Ordinance No. 5736, with energy cost effectiveness study, with the California Energy Commission for certification.

1.) Approval of the energy cost effectiveness study and Ordinance No. 5736 as they relate to local amendments to the 2010 California Green Building Code;

2.) Confirm cost effectiveness of the local amendments contained within Ordinance No. 5736;

3.) Find that adoption of local amendments to the 2010 California Green Building Code is categorically exempt from environmental review under the California Environmental Quality Act, pursuant to section 15308 of the CEQA guidelines, action by regulatory agencies for protection of the environment.

4.) Find that local amendments contained within Ordinance No. 5736 will ensure that the residential and non-residential buildings in the City of Glendale will consume no more energy than permitted by Title 24, part 6.

VII. **REPORTS-INFORMATION ONLY**
A) Monthly Building & Safety Report.

VIII. **ADJOURNMENT**

This notice was posted on Friday, August 10, 2012 at City Hall.

CITY OF GLENDALE CALIFORNIA
REPORT TO
BUILDING & FIRE BOARD OF APPEALS

August 15, 2012

AGENDA ITEM

Public Hearing: To review Ordinance No. 5736 and the associated energy cost effectiveness study precedent to filing same with the California Energy Commission for certification.

BUILDING & FIRE BOARD OF APPEALS ACTION

☐	Public Hearing -	Modification to Provisions of the Glendale Building & Safety Code
☐	Public Hearing -	Alternate Material or Method of Construction
X	Public Hearing -	Review and approval of Ordinance No. 5736 and associated energy cost effectiveness study.
☐	Report Only	

ADMINISTRATIVE ACTION

Signature

Submitted
Stuart Tom, Building Official ..... _____

Prepared
Stuart Tom, Building Official ..... _____

RECOMMENDATION

To find that Ordinance No. 5736 establishes cost effective local energy standards that will ensure that residential and non-residential buildings in the City of Glendale will consume no more energy than permitted by Title 24, Part-6.

GENERAL INFORMATION

Applicant: Stuart Tom, P.E., C.B.O.
Building Official
City of Glendale, California

Applicant Address: 633 E. Broadway, Room # 101
Glendale, CA 91206

APPLICANT'S REQUEST

To conduct a public hearing for the purpose of evaluating the energy cost effectiveness of Ordinance No. 5736 and verifying compliance with Title 24, Part-6.

APPLICABLE CODE(S)

1) 2010 California Green Building Standards Code.
2) 2010 California Energy Code.
3) Building and Safety Code of the City of Glendale, 2011-Volume IX.

SUMMARY

On June 7, 2011, the Glendale City Council adopted Ordinance No. 5736, which established local amendments to the 2010 California Green Building Standards Code. A small number of said amendments establish energy conservation standards which are more stringent than the basic standards contained within Title-24, Part 6 of the California Code of Regulations. Prior to enforcement of local amendments which affect energy consumption, said amendments must be approved and certified by the California Energy Commission.

All of the local amendments relative to energy consumption were modeled after standards contained within the optional "Tier-1" provisions of the California Green Building Standards Code, with the exception of one additional standard related to radiant roof barriers. While the "Tier-1" related amendments have been found to be cost effective by numerous jurisdictions throughout the state of California, the additional amendment related to radiant roof barriers had not been analyzed in terms of specific cost effectiveness. As a required element for consideration by the California Energy Commission, a separate cost effectiveness analysis was required in order to justify the additional standard.

In order to satisfy the cost effectiveness criterion, an additional report was prepared by Gabel Associates, LLC. A copy of such report, titled *"Energy Cost-Effectiveness of Radiant Barrier Roofs in the Glendale Green Building Ordinance"*, dated May 18, 2012 is attached hereto as Exhibit "B". The analysis confirms that radiant roof barriers are cost effective, with a simple pay back period ranging from 7 to 16 years, with an average pay back within the 11 to 12 year range within Climate Zone 9. Assuming that the useful life of roof sheathing is 30 years, the analysis confirms that radiant roof barriers are, indeed, cost effective and will result in simple pay back of

investment during the first-half of the useful life of the roof sheathing alone. Assuming the useful life of buildings within Glendale exceeds 30 years, the financial savings related to radiant roof barriers will greatly exceed the installation cost of the radiant barrier.

Due to the need to secure a specific cost effectiveness analysis related to radiant roof barriers, the City of Glendale has not been able to submit the local amendments to the California Energy Commission for approval and certification. Now that the cost effectiveness analysis is complete, the City of Glendale will proceed forward with an application for approval with the CEC. Public review and approval by the Building and Fire Board of Appeals is necessary before said application may be submitted.

RECOMMENDATION

It is recommended that the Building and Fire Board of Appeals conduct a public hearing in an open forum in accordance with the Brown Act. It is further recommended that the Board consider all information provided, including testimony which may be presented during such public hearing. After the conclusion of the public hearing, if the Board finds that the local amendments relative to energy consumption are cost effective and ensure that buildings consume no more energy than permitted by Title 24, Part-6, the Building Official will submit an application to the California Energy Commission to request approval and certification.

EXHIBITS

A) Ordinance No. 5736.
B) "Energy cost-effectiveness of radiant barrier roofs in the Glendale Green Building Ordinance" by Gabel Associates, LLC, dated May 18, 2012.

CITY OF GLENDALE, CALIFORNIA
Department of Community Development
BUILDING & SAFETY DIVISION

633 East Broadway
Glendale, California 91206-4390
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www.ci.glendale.ca.us

August 21, 2012

Mr. Stuart Tom, P.E., CBO
633 E. Broadway, Room #101
Glendale, CA 91206

RE: Public Hearing Regarding Review of Ordinance No. 5736
and the Associated Energy Cost Effectiveness Study

Please be advised that on August 15, 2012, a public hearing was conducted by the Building and Fire Board of Appeals, for the purpose of reviewing provisions within Ordinance No. 5736 which may have a potential impact on the application of energy standards contained within Title-24, Part 6, C.C.R. Furthermore, the energy cost effectiveness of such provisions was reviewed as a part of the public hearing. As a result of the public hearing, the Board took four (4) actions as follows:

1) Motion: Mardian
Second: Woo

Approval of the energy cost effectiveness study and Ordinance No. 5736 as they relate to local amendments to the 2010 California Green Building Code.

Ayes: Keshishian, Mardian, Tatoulian, Woo
Noes: None

APPROVED

2) Motion: Tatoulian
Second: Woo

Confirm cost effectiveness of the local amendments contained within Ordinance No. 5736.

Ayes: Keshishian, Mardian, Tatoulian, Woo
Noes: None

APPROVED

3) Motion: Mardian
Second: Woo

Find that adoption of local amendments to the 2010 California Green Building Code is categorically exempt from environmental review under the California Environmental Quality Act, pursuant to section 15308 of the CEQA guidelines, action by regulatory agencies for protection of the environment.

Ayes: Keshishian, Mardian, Tatoulian, Woo
Noes: None

APPROVED

4) Motion: Woo
Second: Mardian

Find that local amendments contained within Ordinance No. 5736 will ensure that the residential and non-residential buildings in the City of Glendale will consume no more energy than permitted by Title 24, part 6.

Ayes: Keshishian, Mardian, Tatoulian, Woo
Noes: None

APPROVED

Please be advised that no public objections were received, and the public hearing was closed. If you have any questions, you may contact Ms. Celeste Luna, Recording Secretary to the Building and Fire Board of Appeals, at (818) 548-3200.

Respectfully submitted,

Nejdeh Erik Keshishian, Chairman
Building and Fire Board of Appeals

8/21/12
Date

ORDINANCE NO. 5736

AN ORDINANCE OF THE COUNCIL OF THE CITY OF GLENDALE AMENDING SECTION 202, 301.1, ADDING SECTIONS 301.2, 4.106.4, 4.203, 4.205, 4.207, 4.208, 4.211, 4.509, 5.203, 5.205, 5.208, 5.211 AND RESERVING SECTIONS 4.202, 4.204, 4.206, 4.209, 4.210, 5.202, 5.204, 5.206, 5.207, 5.209, 5.210 OF THE 2010 CALIFORNIA GREEN BUILDING STANDARDS CODE, ADOPTED AS VOLUME IX, OF THE GLENDALE BUILDING AND SAFETY CODE, 2011.

BE IT ORDAINED BY THE COUNCIL OF THE CITY OF GLENDALE:

SECTION 1. Section 202 of Volume IX of the Glendale Building and Safety Code, 2011, the definition for LOW-RISE RESIDENTIAL is hereby amended to read as follows. All other definitions in Section 202 shall remain without change.:

SECTION 202

DEFINITIONS

LOW-RISE RESIDENTIAL. A building that is of Occupancy R and is six stories or less, or that is a one- or two-family dwelling or townhouse.

SECTION 2. Sections 4.303.1, 4.303.2, and 4.303.3 listed in the Residential Occupancies Application Checklist in Section A4.602 are hereby adopted by reference and are hereby incorporated herein as if fully set forth.

SECTION 3. Section 301.1 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby amended to read as follows:

301.1 Scope. Buildings and structures shall be designed to include the green building measures indicated in Section 301.2.

SECTION 4. Section 301.2 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby added to read as follows:

301.2 Applicability. Buildings and structures shall comply with all the requirements specified in this Section relative to occupancy type, size, number of stories, and number of units.

301.2.1 Low-rise residential buildings. Newly constructed low-rise residential buildings as defined in Chapter 2 of this Code shall comply with all applicable requirements of Chapter 4, Residential Mandatory Measures.

301.2.2 Non-low-rise residential buildings. Newly constructed buildings other than those defined in Chapter 2 of this Code as low-rise residential buildings shall comply with all applicable requirements of Chapter 5, Nonresidential Mandatory Measures.

301.2.3 Single family dwellings greater than 5,000 square feet. In addition to the provisions as outlined in Section 301.1 of this code, any newly constructed single family dwellings greater than 5,000 square feet not including the garage area shall comply with CALGreen Tier 1 pursuant to Section 305.1.1.

SECTION 5. Section 4.106.4 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby added to read as follows:

4.106.4 Water permeable surfaces. Permeable paving is utilized for the parking, walking or patio surfaces in compliance with the following.

Not less than 20 percent of the total on-grade, residential uncovered parking, walking or patio surfaces shall be permeable.

Exceptions:

1. The primary driveway, primary entry walkway and entry porch or landing shall not be included when calculating the area required to be a permeable surface.

2. Required accessible routes for persons with disabilities as required by *California Code of Regulations,* Title 24, Part 2, Chapter 11A and/or Chapter 11B as applicable.

SECTION 6. Section 4.202 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby reserved:

SECTION 4.202

DEFINITIONS

(Reserved)

SECTION 7. Section 4.203 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby added to read as follows:

SECTION 4.203

PERFORMANCE APPROACH

4.203.1 Energy performance. When using an Alternative Calculation Method (ACM) approved by the California Energy Commission, calculate each building's energy and CO_2 emissions, and compare it to the standard or "budget" building to achieve the following:

Exceed the *California Energy Code* based on the 2008 energy standards requirements by 15 percent. Field verify and document the measures and calculations used to reach the desired level of efficiency following the requirements specified in the Title 24 Reference Appendices.

SECTION 8. Section 4.204 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby reserved:

SECTION 4.204

PRESCRIPTIVE APPROACH

(Reserved)

SECTION 9. Section 4.205 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby added to read as follows:

SECTION 4.205

BUILDING ENVELOPE

4.205.1 Radiant roof barriers. Radiant roof barrier shall be installed in all new buildings. The radiant barrier must be tested according to ASTM C-1371-98 or ASTM E 408-71(2002) and must be certified by the Department of Consumer Affairs. Radiant barriers must also meet installation criteria specified in Section RA4.2.2 of the *California Energy Commission Residential Appendices.*

SECTION 10. Section 4.206 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby reserved:

SECTION 4.206

AIR SEALING PACKAGE

(Reserved)

SECTION 11. Section 4.207 of Volume IX of the Glendale Building and Safety Code, 2011, is added to read as follows:

SECTION 4.207

HVAC DESIGN, EQUIPMENT AND INSTALLATION

4.207.1 Gas-fired heating equipment. Gas-fired (natural or propane) space heating equipment requires an Annual Fuel Utilization Ratio (AFUE) of .90 or higher.

4.207.2 Cooling equipment. When climatic conditions necessitate the installation of cooling equipment, select cooling equipment with a Seasonal Energy Efficiency Ratio (SEER) higher than 13.0 and an Energy Efficiency Ratio (EER) of at least 11.5.

SECTION 12. Section 4.208 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby added to read as follows:

SECTION 4.208

WATER HEATING DESIGN,

EQUIPMENT AND INSTALLATION

4.208.1 Tank type water heater efficiency. The Energy Factor (EF) for a gas-fired storage water heater shall be higher than .60.

4.208.2 Tankless water heater efficiency. The Energy Factor (EF) for a gas-fired tankless water heater shall be .80 or higher.

SECTION 13. Section 4.209 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby reserved:

SECTION 4.209

LIGHTING

(Reserved)

SECTION 14. Section 4.210 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby reserved:

SECTION 4.210

APPLIANCES

(Reserved)

SECTION 15. Section 4.211 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby added to read as follows:

SECTION 4.211

RENEWABLE ENERGY

4.211.1 Space for future solar installation. A minimum of 250 square feet of unobstructed roof area facing within 30° of south is provided for future solar collector or photovoltaic panels. Rough-in penetrations through the roof surface within 24 inches (610 mm) of the boundary of the unobstructed roof area are provided for electrical conduit and water piping.

Exceptions:

1. For roofs with an area of less than 1000 square feet, the unobstructed space may be reduced to 25% of the roof area.
2. Buildings designed and constructed with a solar photovoltaic system or an alternate system with means of generating electricity at time of final inspection are exempt from this requirement.
3. Where it is not feasible to provide one contiguous area due to the roof configuration, two unobstructed roof areas with a minimum combined area of 250 square feet may be provided.
4. Buildings designed with a green roof making it unfeasible to provide this area are exempt from this requirement.

4.211.2 Future access for solar system. A minimum one-inch (25.4 mm) electrical conduit is provided from the electrical service equipment to an accessible location in the attic or other location approved by the enforcing agency.

SECTION 16. Section 4.509 Volume IX of the Glendale Building and Safety Code, 2011, is hereby added to read as follows:

SECTION 4.509

NATURAL LIGHT AND VENTILATION

4.509.1 Natural light. The minimum net glazed area shall not be less than 10 percent of the floor area of the room served.

4.509.2 Natural ventilation. The minimum openable area to the outdoors shall be 5 percent of the floor area being ventilated.

SECTION 17. Section 5.202 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby reserved:

SECTION 5.202

DEFINITIONS

(Reserved)

SECTION 18. Section 5.203 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby added to read as follows:

SECTION 5.203 PERFORMANCE APPROACH

5.203.1 Energy performance. When using an Alternative Calculation Method approved by the California Energy Commission, calculate each nonresidential building's TDV energy and CO_2 emissions and compare it to the standard or "budget" building.

5.203.1.1 Energy efficiency - 15 percent above Title 24, Part 6. Exceed *California Energy Code* requirements, based on the 2008 *Energy Efficiency Standards*, by 15 percent. Field verify and document the measures and calculations

used to reach the desired level of efficiency following the requirements specified in the Title 24 Reference Appendices.

SECTION 19. Section 5.204 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby reserved:

SECTION 5.204

PRESCRIPTIVE APPROACH

(Reserved)

SECTION 20. Section 5.205 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby added to read as follows:

SECTION 5.205 BUILDING ENVELOPE

5.205.1 Radiant roof barriers. Radiant roof barrier shall be installed in all new buildings. The radiant barrier must be tested according to ASTM C-1371-98 or ASTM E 408-71(2002) and must be certified by the Department of Consumer Affairs.

SECTION 21. Section 5.206 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby reserved:

SECTION 5.206

AIR SEALING PACKAGE

(Reserved)

SECTION 22. Section 5.207 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby reserved:

SECTION 5.207

HVAC DESIGN, EQUIPMENT AND INSTALLATION

(Reserved)

SECTION 23. Section 5.208 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby added to read as follows:

SECTION 5.208

WATER HEATING DESIGN,

EQUIPMENT AND INSTALLATION

5.208.1 Tank type water heater efficiency. The Energy Factor (EF) for a gas-fired storage water heater shall be higher than .60.

5.208.2 Tankless water heater efficiency. The Energy Factor (EF) for a gas-fired tankless water heater shall be .80 or higher.

SECTION 24. Section 5.209 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby reserved:

SECTION 5.209

LIGHTING

(Reserved)

SECTION 25. Section 5.210 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby reserved:

SECTION 5.210

APPLIANCES

(Reserved)

SECTION 26. Section 5.211 of Volume IX of the Glendale Building and Safety Code, 2011, is hereby added to read as follows:

SECTION 5.211

RENEWABLE ENERGY

5.211.4 Prewiring for future solar. Install conduit from the building roof or eave to a location within the building identified as suitable for future installation of a charge controller (regulator) and inverter.

5.211.4.1 Off-grid prewiring for future solar. If battery storage is anticipated, conduit should run to a location within the building that is stable, weather-proof, insulated against very hot and very cold weather and isolated from occupied spaces.

SECTION 27. Effective Date. This ordinance shall become effective and be in full force and effect thirty days after the passage hereof.

SECTION 28. Severability. If any provision of this Ordinance or the application thereof to any person or circumstance is held invalid by a court of competent jurisdiction, that invalidity shall not affect other provisions or applications of this Ordinance that can be given effect without the invalid provision of application, and to this end the provisions of this Ordinance are severable.

Passed by vote of the Council of the City of Glendale on the 7th day of June, 2011.

Mayor

ATTEST:

City Clerk

APPROVED AS TO FORM

General Counsel - Public Works

Date: 6-2-11

STATE OF CALIFORNIA)
COUNTY OF LOS ANGELES) SS.
CITY OF GLENDALE)

I, ARDASHES KASSAKHIAN, City Clerk of the City of Glendale, certify that the foregoing Ordinance No. 5736 was passed by the Council of the City of

Glendale, California, at a regular meeting held on the 7th day of June, 2011, and that the same was passed by the following vote:

Ayes: Manoukian, Najarian, Weaver, Friedman
Noes: None
Abstain: None
Absent: Quintero

City Clerk

Energy Cost-Effectiveness of Radiant Barrier Roofs in the Glendale Green Building Ordinance

May 18, 2012

Report prepared for:
Stuart Tom, P.E., CBO
Building Official
City of Glendale
633 E. Broadway, Room 101
Glendale, CA 91206
(818) 548-3200
Email: STom@ci.glendale.ca.us

Report prepared by:
Michael Gabel
Gabel Associates, LLC
1818 Harmon Street, Suite #1
Berkeley, CA 94703
(510) 428-0803
mike@gabelenergy.com

Table of Contents

1.0 Executive Summary

Gabel Associates has researched and reviewed the energy cost-effectiveness of the roof radiant barrier requirement within the City of Glendale Ordinance No. 5736, Section 4.205.1. This study considers the cost-effectiveness of a radiant barrier above an attic space in three prototypical single family homes. An analysis using state-approved compliance software, Micropas v8.1, has been conducted to evaluate annual site energy savings, site energy cost savings and cost-effectiveness of a radiant barrier. The conservative assumption made is that the radiant barrier has not already been specified in the base case design to meet the overall energy performance requirement of 15% better than state code. Omitted from the study are any external costs of climate change – either mitigation or adaptation -- associated with increase in CO2-e emissions; or widely predicted increases in summer temperatures in California which would tend to further increase cost effectiveness of cooling reduction measures.

2.0 Radiant Barrier Cost-Effectiveness in Climate Zone 9

A common approach to establishing cost-effectiveness of an energy measure is to consider the site impacts on prototypical buildings. Gabel Associates has performed such an approach which uses current state-approved compliance software to determine annual energy savings and energy cost savings associated with roof radiant barriers for three single family buildings:

(1) 1,850 square foot 2-story slab-on-grade home
(2) 2,450 square foot 2-story slab-on-grade home
(3) 2,850 square foot 2-story slab-on-grade home

For each building prototype, two base case energy designs are first established which just meet the current Title 24 Building Energy Efficiency Standards without a radiant barrier. The buildings are run in Climate Zone 9, the local California climate zone that covers all buildings within City limits. In the first scenario, *Base Case 1*, there is neither a radiant barrier nor a cool roof. In the second scenario, *Base Case 2*, there is only a cool roof but no radiant barrier. To each of these, a radiant barrier is added and the computer models re-run to see incremental energy impacts. From the hour-by-hour computer simulations used within the compliance software, it is possible to obtain a relatively accurate picture of the change in annual electricity and natural gas use and in annual energy costs by the inclusion of the attic radiant barrier.

From data researched by Gabel Associates, and also confirmed by independent research by the City of Glendale, a typical range of incremental cost for a continuous radiant barrier on the underside surface of roof sheathing (e.g., foil faced plywood) is in the range of $0.25 to $0.27 per square foot. The average unit cost of electricity is assumed to be $0.16/KWh and average unit cost of natural gas $0.95/therm. From first cost and energy cost assumptions, a Simple Payback is calculated.

Base Case: 1,850 SF

1,850 SF Title 24 Base Case: No Cool Roof

Energy Efficiency Measures
R-38 Roof (Reflectance=0.08, Emittance=0.85)
R-13 Walls
R-0 Slab on Grade
Low E2 Vinyl Windows, U=0.36, SHGC=0.30
Furnace: 80% AFUE
Air Conditioner: 13 SEER
R-8 Attic Ducts
50 Gallon Gas Water Heater: EF=0.62
Pipe Insulation

1,850 SF Title 24 Base Case: Cool Roof

Energy Efficiency Measures
R-30 Cool Roof (Reflectance=0.55, Emittance=0.85)
R-13 Walls
R-0 Slab on Grade
Low E Vinyl Windows, U=0.40, SHGC=0.36
Furnace: 80% AFUE
Air Conditioner: 13 SEER
R-6 Attic Ducts
50 Gallon Gas Water Heater: EF=0.60

Incremental Cost: 1,850 SF

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-38 Roof w/ Radiant Barrier (from R-38 w/o Radiant Barrier): 1,110 sf @ 0.25 to 0.27/sf	Upgrade	$ 278	$ 300	$ 289
R-13 Walls	-	$ -	$ -	$ -
R-0 Slab on Grade	-	$ -	$ -	$ -
Low E2 Vinyl Windows, U=0.36, SHGC=0.30	-	$ -	$ -	$ -
Furnace: 80% AFUE	-	$ -	$ -	$ -
Air Conditioner: 13 SEER		$ -	$ -	$ -
R-8 Attic Ducts	-	$ -	$ -	$ -
50 Gallon Gas Water Heater: EF=0.62		$ -	$ -	$ -
Pipe Insulation	-	$ -	$ -	$ -
Total Incremental Cost of Energy Efficiency Measures:		**$ 278**	**$ 300**	**$ 289**
Total Incremental Cost per Square Foot of Home:		**$ 0.15**	**$ 0.16**	**$ 0.16**

Base Case: 2,450 SF

2,450 SF Title 24 Base Case: No Cool Roof

Energy Efficiency Measures
R-38 Roof (Reflectance=0.08, Emittance=0.85)
R-13 Walls
R-0 Slab on Grade
Low E2 Vinyl Windows, U=0.36, SHGC=0.30
Furnace: 80% AFUE
Air Conditioner: 13 SEER
R-8 Attic Ducts
50 Gallon Gas Water Heater: EF=0.62

2,450 SF Title 24 Base Case: Cool Roof

Energy Efficiency Measures
R-30 Cool Roof (Reflectance=0.55, Emittance=0.85)
R-13 Walls
R-0 Slab on Grade
Low E Vinyl Windows, U=0.40, SHGC=0.36
Furnace: 80% AFUE
Air Conditioner: 13 SEER
R-6 Attic Ducts
50 Gallon Gas Water Heater: EF=0.61

Incremental Cost: 2,450 SF

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-38 Roof w/ Radiant Barrier (from R-38 w/o Radiant Barrier): 1,470 sf @ 0.25 to 0.27/sf	Upgrade	$ 368	$ 397	$ 382
R-13 Walls	-	$ -	$ -	$ -
R-0 Slab on Grade	-	$ -	$ -	$ -
Low E2 Vinyl Windows, U=0.36, SHGC=0.30	-	$ -	$ -	$ -
Furnace: 80% AFUE	-	$ -	$ -	$ -
Air Conditioner: 13 SEER		$ -	$ -	$ -
R-8 Attic Ducts	-	$ -	$ -	$ -
50 Gallon Gas Water Heater: EF=0.62		$ -	$ -	$ -
Total Incremental Cost of Energy Efficiency Measures:		**$ 368**	**$ 397**	**$ 382**
Total Incremental Cost per Square Foot per Home:		**$ 0.15**	**$ 0.16**	**$ 0.16**

Base Case: 2,850 SF

2,850 SF Title 24 Base Case: No Cool Roof

Energy Efficiency Measures
R-38 Roof (Reflectance=0.08, Emittance=0.85)
R-13 Walls
R-0 Slab on Grade
Low E2 Vinyl Windows, U=0.36, SHGC=0.30
Furnace: 80% AFUE
Air Conditioner: 13 SEER
R-8 Attic Ducts
50 Gallon Gas Water Heater: EF=0.62

2,850 SF Title 24 Base Case: Cool Roof

Energy Efficiency Measures
R-30 Cool Roof (Reflectance=0.55, Emittance=0.85)
R-13 Walls
R-0 Slab on Grade
Low E Vinyl Windows, U=0.40, SHGC=0.36
Furnace: 80% AFUE
Air Conditioner: 13 SEER
R-6 Attic Ducts
50 Gallon Gas Water Heater: EF=0.61

Incremental Cost: 2,850 SF

Energy Efficiency Measures	Change Type	Incremental Cost Estimate		
		Min	Max	Avg
R-38 Roof w/ Radiant Barrier (from R-38 w/o Radiant Barrier): 1,710 sf @ 0.25 to 0.27/sf	Upgrade	$ 428	$ 462	$ 445
R-13 Walls	-	$ -	$ -	$ -
R-0 Slab on Grade	-	$ -	$ -	$ -
Low E2 Vinyl Windows, U=0.36, SHGC=0.30	-	$ -	$ -	$ -
Furnace: 80% AFUE	-	$ -	$ -	$ -
Air Conditioner: 13 SEER		$ -	$ -	$ -
R-8 Attic Ducts	-	$ -	$ -	$ -
50 Gallon Gas Water Heater: EF=0.62		$ -	$ -	$ -
Total Incremental Cost of Energy Efficiency Measures:		**$ 428**	**$ 462**	**$ 445**
Total Incremental Cost per Square Foot:		**$ 0.15**	**$ 0.16**	**$ 0.16**

Results

As noted above, the following results assume that a radiant barrier has not initially been specified in the building energy design, but may contribute to the overall energy performance to achieve 15% better than state code as another section of the Glendale ordinance requires for new homes. In that sense, the radiant barrier is only one of the set of energy measures which achieves 15% better than Title 24 Part 6.

Building Description	Total Annual KWh Saving	Total Annual Therms Saving	Incremental First Cost ($)	Annual Energy Cost Savings ($)	Simple Payback (Years)
1,850 sf Base 1 + Radiant	**235**	**2**	**$289**	**$40**	**7.3**
1,850 sf Base 2 + Radiant	**101**	**4**	**$289**	**$20**	**14.5**
Averages:	**168**	**3**	**$289**	**$30**	**10.9**

Building Description	Total Annual KWh Saving	Total Annual Therms Saving	Incremental First Cost ($)	Annual Energy Cost Savings ($)	Simple Payback (Years)
2,450 sf Base 1 + Radiant	285	1	$383	$47	8.2
2,450 sf Base 2 + Radiant	124	5	$383	$25	15.6
Averages:	205	3	$383	$36	11.9

Building Description	Total Annual KWh Saving	Total Annual Therms Saving	Incremental First Cost ($)	Annual Energy Cost Savings ($)	Simple Payback (Years)
2,850 sf Base 1 + Radiant	317	1	$445	$52	8.6
2,850 sf Base 2 + Radiant	142	6	$445	$28	15.7
Averages:	230	4	$445	$40	12.1

3.0 Conclusions

Simple paybacks for radiant barrier in the three prototype single family homes range from 7 to 16 years in the Glendale climate, with an average payback in the 11 to 12 year range. Assuming that the useful life of roof sheathing is 30 years, and based on this analysis, radiant barriers are cost-effective as a mandatory requirement for roofing above attic spaces in Climate Zone 9.

It is also worth noting that even without radiant barrier as a local mandatory measure, it is highly likely that the vast majority of new single family homes would include a radiant barrier in order to meet the 15%-better-than-Title 24 performance requirement.